

PATENT ABSTRACTS OF JAPAN

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(21) Application number : 2000-048231 (71) Applicant : ASAHI NATIONAL LIGHTING CO LTD

(22) Date of filing : 24.02.2000 (72) Inventor : KANDA TAKESHI

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(54) COLOR CHANGEABLE LIGHTING EQUIPMENT

(57) Abstract:

PROBLEM TO BE SOLVED: To obtain a small and color changeable lighting equipment which can change a light color quickly.

SOLUTION: The color changeable lighting equipment is composed of light source (red R, green G, and blue B) in three primary colors, and optical elements 1, 2, 3 which consist of a mirror-cum-filter which are arranged on the same axle while countering aslant with each the light sources. Here, the optical element 3 of the front end side of irradiation is equipped with the characteristics that it penetrates colors G, R irradiated from the middle and the back end sides while reflecting the color B of the light source which counters this and the middle optical element 2 is equipped with the characteristics that it penetrates the color R irradiated from the back end side while reflecting the color G of the light source which counters this and the optical element 1 of the back end side is equipped with the characteristics of reflecting the color R of the light source which counters this. By these establishments, the color changeable light equipment can irradiate variable color lights to the front end side by changing the light intensity of each light source.

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## CLAIMS

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[Claim(s)]

[Claim 1] It has the optical element which consists of a mirror-cum-a filter with which they have been arranged on the same axle while countering with the light source in three primary colors and each light source and having been arranged aslant. The optical element by the side of the exposure front end is equipped with the property which penetrates the color irradiated from the middle and back end side while reflecting the color of the light source which counters this. A middle optical element is equipped with the property which penetrates the color irradiated from the back end side while reflecting the color of the light source which counters this. The optical element by the side of the back end is the good discoloration lighting system whose exposure in good discoloration light was enabled at the front end side by having the property of reflecting the color of the light source which counters this, and carrying out adjustable [ of the luminescence reinforcement of each light source ].

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to a good discoloration lighting system.

[0002]

[Description of the Prior Art] The conventional good discoloration lighting system had prepared the color filter and film of a rotating type all over the source of the white light.

[0003]

[Problem(s) to be Solved by the Invention] However, equipment became large-scale and the color substitute had taken time amount. Therefore, this invention aims at offering the good discoloration lighting system which can make small and a color substitute quick in view of such a technical problem that should be solved.

[0004]

[Means for Solving the Problem] It is as having been shown in the claim.

[0005]

[Embodiment of the Invention] Next, although the operation gestalt of this invention is explained, it is the instantiation operation gestalt adopted based on this invention to the last, the limited interpretation of this invention must not be carried out based on a matter peculiar to the operation gestalt, and the technical range of this invention must be substantially determined to the matter pan shown in the claim as the matter based on an equivalent matter.

[0006] The operation gestalt of illustration is equipped with optical element 1-2-3 which consists of a mirror-cum-a filter

with which they have been arranged on the same axle while countering with the light source (red R, green G, and blue B) in three primary colors and each light source and having been arranged aslant. The optical element 3 by the side of the exposure front end is equipped with the property which penetrates color G-R irradiated from the middle and back end side while reflecting the color B of the light source which counters this. The middle optical element 2 is equipped with the property which penetrates the color R irradiated from the back end side while reflecting the color G of the light source which counters this. The optical element 1 by the side of the back end is the good discoloration lighting system whose exposure in good discoloration light was enabled at the front end side by having the property of reflecting the color R of the light source which counters this, and carrying out adjustable [ of the luminescence reinforcement of each light source ].

[0007] These components are stored in a case 4 and the iris shutter 5 and a lens 6 are formed in the front end of a case 4. And each light source is controlled by the control panel 7 and the drive board 8, and by changing the location of the fader 9 of a control panel 7, adjustable [ of the luminescence reinforcement of each light source ] is carried out, and it is enabling the exposure of good discoloration light at the front end side. In addition, the control panel 7 could control two or more good discoloration lighting systems, and is equipped with two or more sets of phase control components 10, such as a triac which also builds in the drive board 8. According to this operation gestalt, the good discoloration lighting system which can make small and a color substitute quick can be offered.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] The sectional view showing the operation gestalt of this invention

[Drawing 2] This system tree

[Description of Notations]

R-G-B The light source in three primary colors

1-2-3 Optical element

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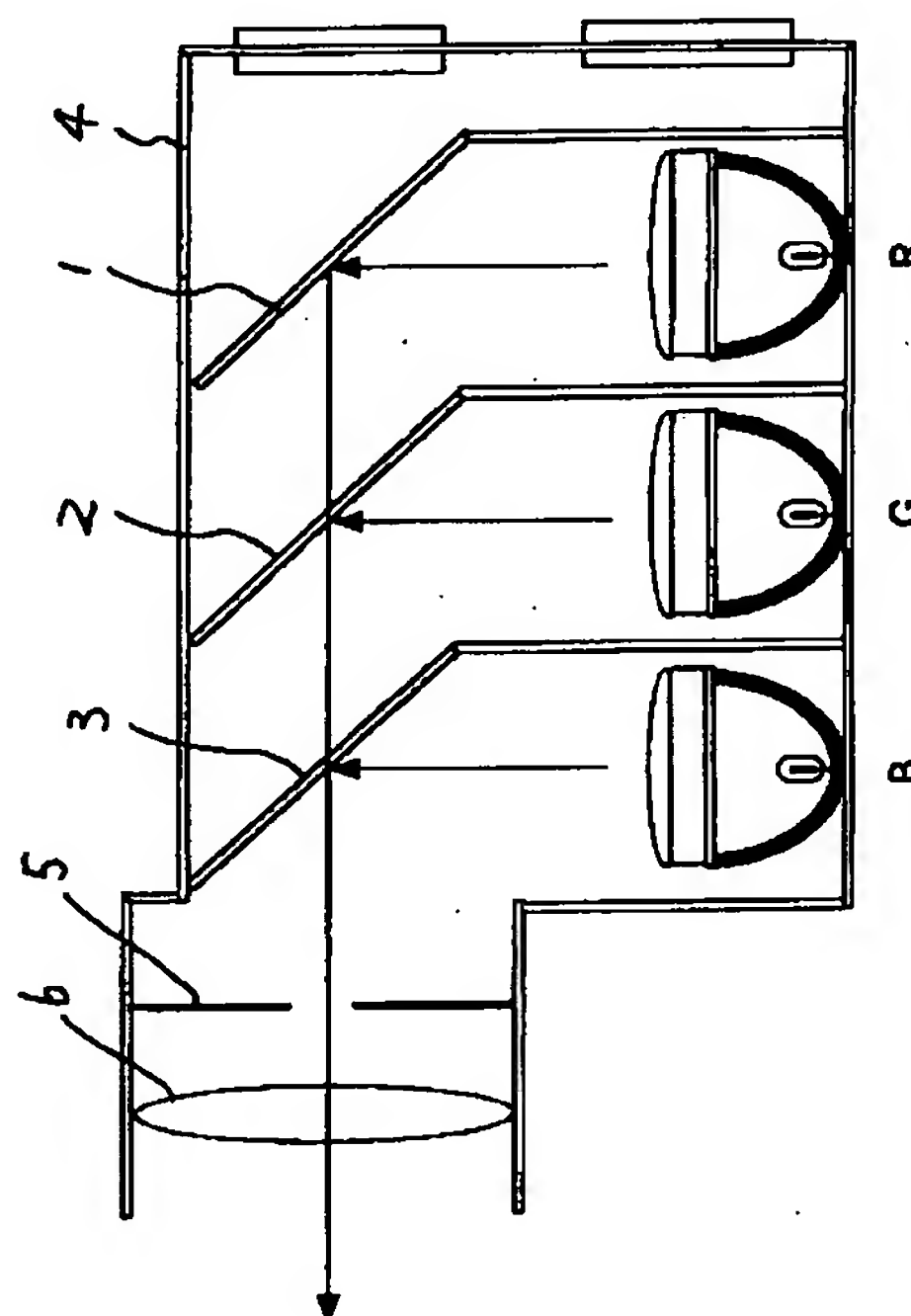
CJ07 CJ21

(54) 【発明の名称】 可変色照明装置

(57) 【要約】

【課題】 小型かつ色替えを素早くできる可変色照明装置を提供する。

【解決手段】 三原色の光源 (赤 R・緑 G・青 B) と、各光源と対向して斜めに配置されるとともにそれらが同軸上に配置されたミラー兼フィルターからなる光学要素 1・2・3 を備え、照射前端側の光学要素 3 はこれに対向する光源の色 B を反射するとともに中間及び後端側から照射された色 G・R を透過する特性を備え、中間の光学要素 2 はこれに対向する光源の色 G を反射するとともに後端側から照射された色 R を透過する特性を備え、後端側の光学要素 1 はこれに対向する光源の色 R を反射する特性を備え、各光源の発光強度を可変することにより前端側に可変色光を照射可能とした可変色照明装置である。



## 【特許請求の範囲】

【請求項1】 三原色の光源と、各光源と対向して斜めに配置されるとともにそれらが同軸上に配置されたミラー兼フィルターからなる光学要素を備え、照射前端側の光学要素はこれに対向する光源の色を反射するとともに中間及び後端側から照射された色を透過する特性を備え、中間の光学要素はこれに対向する光源の色を反射するとともに後端側から照射された色を透過する特性を備え、後端側の光学要素はこれに対向する光源の色を反射する特性を備え、各光源の発光強度を可変することにより前端側に可変色光を照射可能とした可変色照明装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、可変色照明装置に関する。

## 【0002】

【従来の技術】従来の可変色照明装置は、白色光源の全面に回転式の色フィルターやフィルムを設けていた。

## 【0003】

【発明が解決しようとする課題】しかし、装置が大掛かりになったり、色替えに時間がかかっていた。従って、本発明はこのような解決すべき課題を鑑み、小型かつ色替えを素早くできる可変色照明装置を提供することを目的とする。

## 【0004】

【課題を解決するための手段】請求項に示した通りである。

## 【0005】

【発明の実施の形態】次に、本発明の実施形態を説明するが、それはあくまで本発明に基づいて採択された例示的な実施形態であり、本発明をその実施形態に特有な事

\* 項に基づいて限定解釈してはならず、本発明の技術的範囲は、請求項に示した事項さらにはその事項と実質的に等価である事項に基づいて定めなければならない。

【0006】図示の実施形態は、三原色の光源（赤R・緑G・青B）と、各光源と対向して斜めに配置されるとともにそれらが同軸上に配置されたミラー兼フィルターからなる光学要素1・2・3を備え、照射前端側の光学要素3はこれに対向する光源の色Bを反射するとともに中間及び後端側から照射された色G・Rを透過する特性を備え、中間の光学要素2はこれに対向する光源の色Gを反射するとともに後端側から照射された色Rを透過する特性を備え、後端側の光学要素1はこれに対向する光源の色Rを反射する特性を備え、各光源の発光強度を可変することにより前端側に可変色光を照射可能とした可変色照明装置である。

【0007】これらの構成要素はケース4に収められ、ケース4の前端にはアイリスシャッター5とレンズ6が設けられる。そして、各光源は操作盤7と駆動盤8で制御され、操作盤7のフェーダー9の位置を変えることにより各光源の発光強度が可変され、前端側に可変色光を照射可能としている。なお、操作盤7は複数の可変色照明装置を制御でき、駆動盤8も内蔵するトライアック等の位相制御素子10を複数組備えている。本実施形態によれば、小型かつ色替えを素早くできる可変色照明装置を提供できる。

## 【図面の簡単な説明】

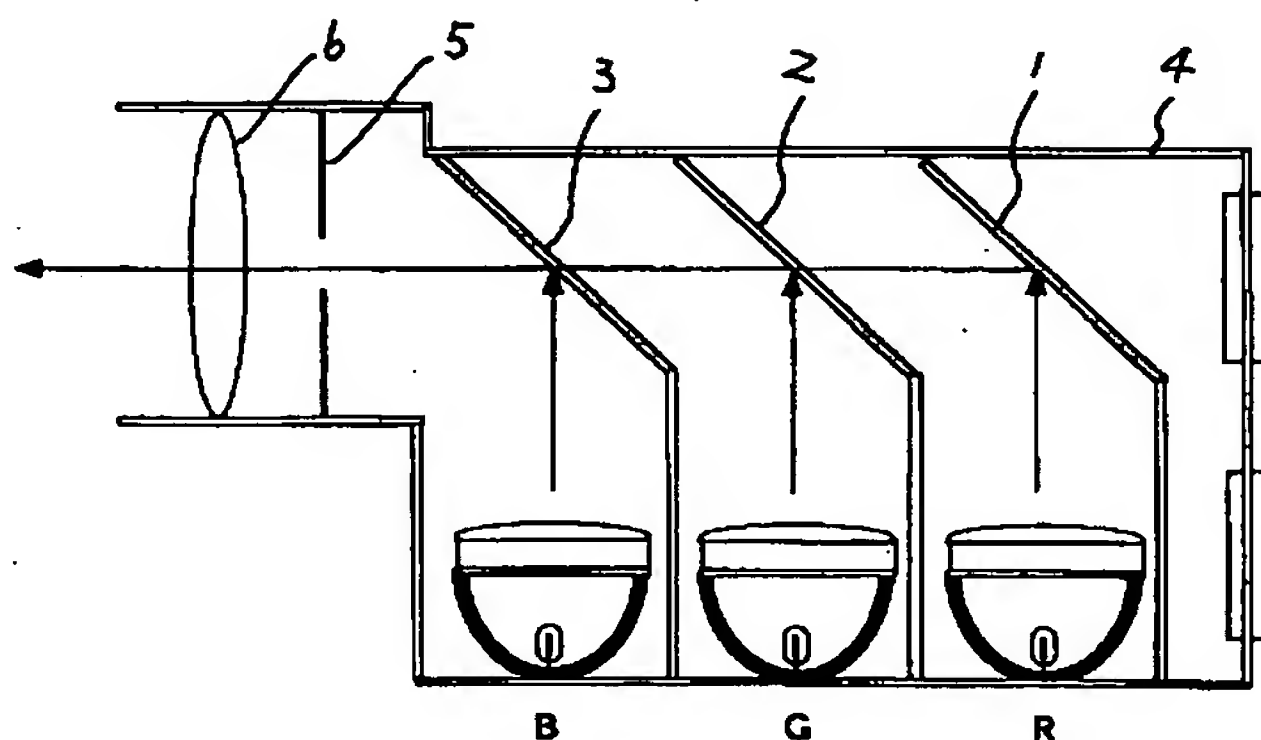
【図1】本発明の実施形態を示す断面図

【図2】同システム系統図

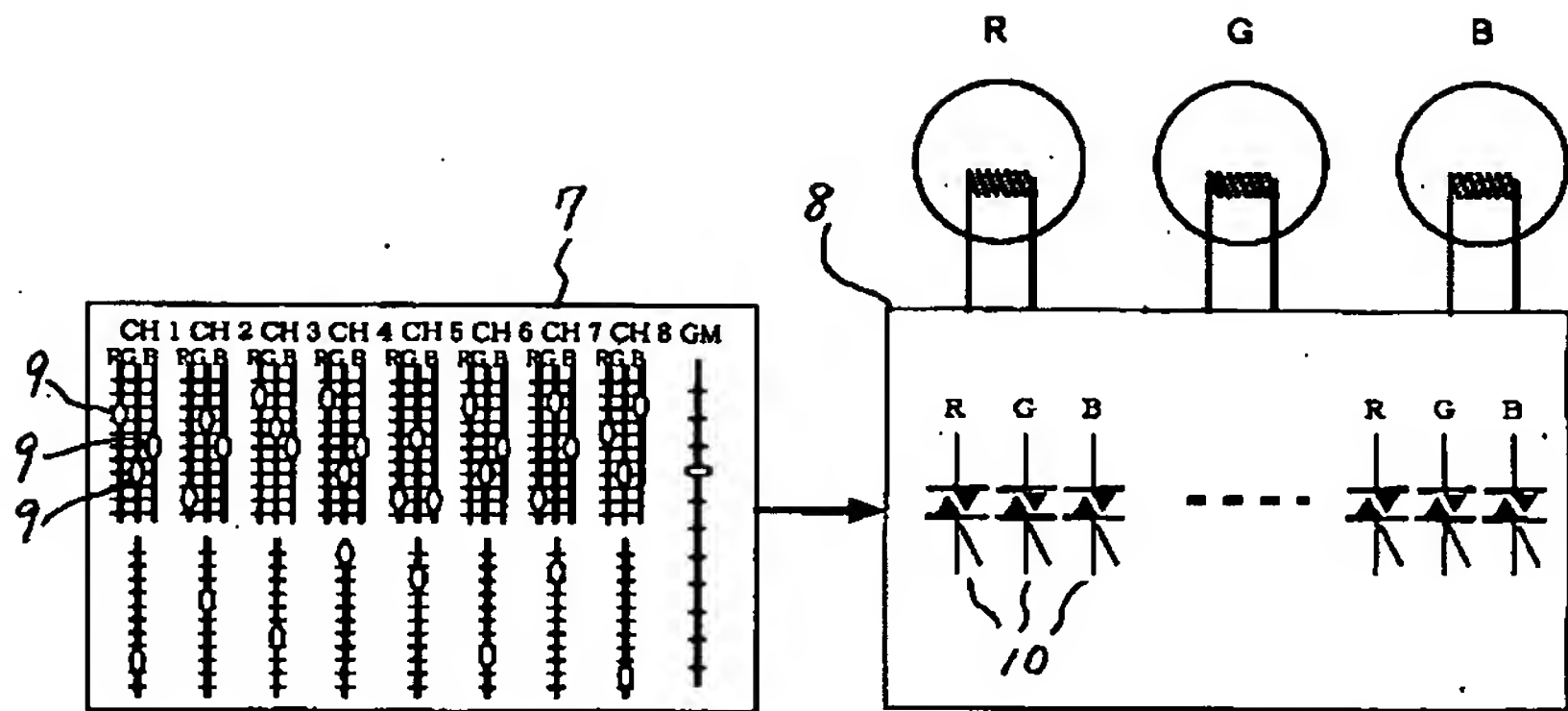
## 【符号の説明】

R・G・B 三原色の光源  
1・2・3 光学要素

【図1】



【図2】





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(71) Applicant : SHARP CORP

(22) Date of filing : 26.06.2001

(72) Inventor : MASUDA YOSHIYUKI

WATANABE HISASHI  
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(54) FRONT LIGHT AND REFLECTION TYPE DISPLAY DEVICE USING THE SAME

(57) Abstract:

PROBLEM TO BE SOLVED: To enhance visibility of a display surface by making a optimized design of a prism shape of a light guide plate easy with fixed polarization of incident light into the light guide plate, with achieving low power consumption by enhancing an efficiency of utilization of light from a light source through recombination of polarization and reflection.

SOLUTION: This front light has a point light source 51, a guide rod 62 that converts light from the point light source to a uniform linear light source and a transmissive light guide plate 12 that has unevenness on one surface, and the front light outputs lighting light through the other surface of the light guide plate 12. A prism sheet 64 that reduces light to parallel light and a reflection-polarization film 65 that gives fixed polarization are located between the guide rod 62 and the light guide plate 12. Furthermore, a scattering reflector 66 that encloses the periphery of the guide rod 62 is arranged and reflectors 16 is arranged on three side surfaces other than the side surface opposite the light source of the light guide plate 12.  
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## CLAIMS

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[Claim(s)]

[Claim 1] It is arranged so that incidence of the light by which outgoing radiation is carried out from the light source and this light source may be carried out to the interior from one side face. The light guide plate formed in the concave convex which has the steep incline section which reflects regularly with the gentle slope section which carries out total reflection of the light to which one front face is flat and total reflection of the front face of another side is carried out on a flat front face, and carries out outgoing radiation from the front face of another side, The front light possessing the polarization means which makes light by which incidence is carried out to this light guide plate from this light source a predetermined polarization condition.

[Claim 2] Said polarization means is a front light according to claim 1 which makes light by which incidence is carried out to said light guide plate from said light source the linearly polarized light.

[Claim 3] the light by which incidence is carried out from the point light source and this point light source -- a uniform line -- with the guide rod which changes into light and carries out incidence to this light guide plate It is arranged so that incidence of the light from this guide rod may be carried out to the interior from one side face. The light guide plate formed in the concave convex which has the steep incline section which reflects regularly with the gentle slope section which carries out total reflection of the light to which one front face is flat and total reflection of the front face of another side is carried out on a flat front face, and carries out outgoing radiation from the front face of another side, The front light possessing the polarization means which makes light by which incidence is carried out to this light guide plate from this guide rod a predetermined polarization condition.

[Claim 4] the light by which incidence is carried out from the point light source and this point light source -- a uniform line -- with the guide rod which changes into light and carries out incidence to this light guide plate It is arranged so that incidence of the light from this guide rod may be carried out to the interior from one side face. The light guide plate formed in the concave convex which has the steep incline section which reflects regularly with the gentle slope section which carries out total reflection of the light to which one front face is flat and total reflection of the front face of another side is carried out on a flat front face, and carries out outgoing radiation from the front face of another side, The front light possessing the polarization means which makes light by which incidence is carried out to this guide rod from this point light source a predetermined polarization condition.

[Claim 5] Said polarization means is a reflective mold polarizing plate which is made to penetrate the predetermined linearly polarized light and is made to reflect other light. Furthermore, a polarization conversion means to change the reflected light reflected by this reflective mold polarizing plate into random light or the light which carried out 90-degree rotatory polarization is established. The front light according to claim 1 to 4 which changes the light reflected by this reflective mold polarizing plate with this polarization conversion means, and carries out re-incidence to this reflective mold polarizing plate.

[Claim 6] Said polarization conversion means is a front light according to claim 5 which is a scattered plate.

[Claim 7] Said polarization conversion means is a front light according to claim 5 which has a quarter-wave length plate



and a reflecting plate.

[Claim 8] Said polarization means has a cholesteric-liquid-crystal film, a quarter-wave length plate, and a polarizing plate. The predetermined circular polarization of light which penetrated this cholesteric-liquid-crystal film is made into the predetermined linearly polarized light with this quarter-wave length plate and this polarizing plate. It has the reflecting plate which reflects in this cholesteric-liquid-crystal film side the light reflected by this cholesteric-liquid-crystal film. A front light given in either the claim by which penetrates this cholesteric-liquid-crystal film and re-incidence is carried out to this quarter-wave length plate and this polarizing plate after the light reflected by this cholesteric-liquid-crystal film is reflected with this reflecting plate and the hand of cut of the circular polarization of light is changed - claim 4.

[Claim 9] The front light according to claim 1 to 8 with which the condensing means for carrying out parallel Guanghua of the light to the optical incidence side of said polarization means is established.

[Claim 10] Said polarization means has the beam splitter which carries out polarization separation of the light from said light source at the transmitted light and the reflected light. The reflecting plate made to reflect the reflected light by which incidence of the predetermined linearly polarized light which penetrated this beam splitter was carried out to said guide rod, and it was further reflected in this beam splitter in the direction of this guide rod, A polarization conversion means to change into the same linearly polarized light as the transmitted light the light reflected by this reflecting plate is established. The front light according to claim 4 with which it is reflected in this guide rod direction by this reflecting plate, the light reflected in this beam splitter is changed into the same linearly polarized light as the transmitted light by this polarization conversion means, and incidence is carried out to this guide rod.

[Claim 11] Said polarization means has the beam splitter which carries out polarization separation of the light from said light source at the transmitted light and the reflected light. A polarization conversion means to change into the same linearly polarized light as the transmitted light the light by which incidence of the predetermined linearly polarized light which penetrated this beam splitter was carried out to said guide rod, and it was further reflected in this beam splitter, It has the reflecting plate made to reflect the changed light toward this guide rod. The front light according to claim 4 with which it is reflected by this reflecting plate and incidence of the light from which the light reflected in this beam splitter was changed by this polarization conversion means, and was changed and changed into the same linearly polarized light as the transmitted light is carried out to this guide rod.

[Claim 12] Said polarization conversion means is a front light according to claim 10 or 11 which consists of  $1/2$  wavelength plate.

[Claim 13] The front light according to claim 10 to 12 with which the condensing means for carrying out parallel Guanghua of the light to the optical incidence side of said polarization means is established.

[Claim 14] Said guide rod is a front light according to claim 3 to 13 which has the concave heights for equalizing the incident light to said light guide plate to either [ at least ] the field by the side of said light guide plate, or the field of the opposite side.

[Claim 15] the light by which incidence is carried out from the point light source and this point light source -- a uniform line -- with the guide rod changed and outputted to light It is arranged so that incidence of the light from this guide rod may be carried out to the interior from one side face. One front face is flat and the light guide plate formed in the concave convex which has the steep incline section which the front face of another side reflects regularly with the gentle slope section which carries out total reflection of the light by which total reflection is carried out on a flat front face, and carries out outgoing radiation from the front face of another side is provided. This guide rod is a front light which has the polarization function incidence of the light from this point light source is carried out [ function ] to this light guide plate as a predetermined polarization condition.

[Claim 16] Said guide rod is the front light according to claim 15 constituted so that light from said point light source might be made into the predetermined linearly polarized light while two or more translucency transparent materials which have the inclined plane which inclined at an angle of predetermined to the direction of optical incidence, respectively joined the inclined planes and they were constituted.

[Claim 17] While two or more translucency transparent materials which have the inclined plane which inclined at an angle of predetermined to the direction of optical incidence, respectively join the inclined planes and they are constituted, said guide rod Have the rod object of the pair constituted so that light from said point light source might be made into the predetermined linearly polarized light, have become in the direction in which the inclination direction of the inclined plane of the translucency transparent material in each rod object conflicts, and each rod object is received. The front light according to claim 15 with which incidence of the light from the point light source is carried out, respectively.

[Claim 18] Said light source is a front light according to claim 1 to 17 which consists of light emitting diode.

[Claim 19] A front light given in either the claim by which the reflecting plate is formed in at least one side face other than said light source or said guide rod, and the side face which counters in the periphery of said light guide plate - \*\*\*\*\* 18.

[Claim 20] The front light according to claim 1 to 19 with which the polarizing plate whose plane of polarization corresponded with the polarization shaft of the predetermined linearly polarized light by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate is prepared in the optical outgoing radiation side of said light guide plate.

[Claim 21] The front light according to claim 1 to 19 with which the polarizing plate whose plane of polarization corresponded with the polarization shaft of the predetermined linearly polarized light by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate is prepared in the outdoor daylight plane-of-incidence side of said light guide plate.

[Claim 22] The front light according to claim 1 to 19 set up so that the polarization shaft of the predetermined polarization by which the polarizing plate and the phase contrast plate are formed in the outdoor daylight plane-of-incidence side of said light guide plate, and outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate, and the polarization shaft of the polarization which is made to pass this polarizing plate and this phase contrast plate, and is acquired in outdoor daylight may be in agreement.

[Claim 23] The front light according to claim 1 to 19 with which plane of polarization has the polarizing plate which intersected perpendicularly with the polarization shaft of the predetermined polarization by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate in the outdoor daylight plane-of-incidence side of said light guide plate.

[Claim 24] The reflective mold display which has a front light according to claim 1 to 23 and a reflective mold display panel, and displays by irradiating the light or outdoor daylight by which outgoing radiation was carried out from this front light at this reflective mold display panel.

[Claim 25] The reflective mold display with which it is the reflective mold display which displays by irradiating the light or outdoor daylight by which has a front light according to claim 23 and a reflective mold display panel, and outgoing radiation was carried out from this front light at this reflective mold display panel, and the driving signal at the time of displaying using the light by which outgoing radiation was carried out, and the driving signal at the time of displaying using outdoor daylight are in the reversal condition from the front light.

[Claim 26] The reflective mold display according to claim 24 or 25 which has a means to reflect the light or outdoor daylight by which outgoing radiation was carried out from said front light in the direction which irradiated said reflective mold display panel and shifted from specular reflection.

[Claim 27] Said reflective mold display panel is a reflective mold display according to claim 26 which has a reflective mold hologram as a means to reflect the light or outdoor daylight by which outgoing radiation was carried out from said front light in the direction [ specular reflection ] shifted.

[Claim 28] Said reflective mold display panel is a reflective mold display according to claim 26 which has the reflecting plate which prepared two or more inclined planes which inclined from said front light to the screen as a means to reflect the light or outdoor daylight by which outgoing radiation was carried out in the direction [ specular reflection ] shifted.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] To the reflective mold display panel which displays using outdoor daylight, such as the natural light, this invention relates to the reflective mold display using the front light and it which irradiate light auxiliary, when outdoor daylight is scarce.

[0002]

[Description of the Prior Art] The display of the flat panel mold represented by the liquid crystal display is divided roughly into the transparency mold display which displays by making the light which carried out incidence to the display panel penetrate, and the reflective mold display which displays by making a display panel reflect the light which carried out incidence.

[0003] The transparency mold liquid crystal display which is the representation of a transparency mold display has the liquid crystal display component with which it comes to hold a liquid crystal layer between two glass substrates with which the transparent electrode was prepared, a polarizing plate is arranged at the both sides of the liquid crystal display component, and the liquid crystal display panel is constituted. In this transparency mold liquid crystal display, light is irradiated by the liquid crystal display panel with the lighting system arranged at the tooth back of a liquid crystal display panel, and incidence of the linearly polarized light is carried out to a liquid crystal layer through a polarizing plate. And by impressing an electrical potential difference between the transparent electrodes prepared in two glass substrates, the polarization condition of the linearly polarized light which carried out incidence to the liquid crystal layer is modulated, and a display image is formed of the light which penetrated the liquid crystal layer.

[0004] The back light as the above-mentioned lighting system is an indispensable component, and it is necessary to make a transparency mold liquid crystal display always turn it on on the occasion of a display. For this reason, there is a problem that much power is consumed with a back light, to the power consumption of the whole indicating equipment. In such a transparency mold liquid crystal display, in order to raise brightness and to attain low-power-ization, various approaches are developed. However, in order that a back light may consume the great portion of power of the whole indicating equipment, as an indicating equipment for pocket devices with which the drive of the long duration by the dc-battery is demanded, the transparency mold liquid crystal display is not suitable.

[0005] On the other hand, a reflecting plate is arranged at the tooth back of a liquid crystal display component, a polarizing plate, a phase contrast plate, etc. are arranged, and, as for the reflective mold liquid crystal display which is the representation of a reflective mold display, the liquid crystal display panel is constituted at the front-face (screen) side. In this reflective mold liquid crystal display, incidence of the outdoor daylight, such as the natural light, is carried out to a liquid crystal display panel from the front-face (screen) side of a liquid crystal display panel. And by impressing an



electrical potential difference between the transparent electrodes respectively prepared in two glass substrates, the polarization condition of the linearly polarized light which carried out incidence to the liquid crystal layer of a liquid crystal display component is modulated, and a display image is formed of the light which penetrated the liquid crystal layer and was reflected with the reflecting plate.

[0006] Since the back light which irradiates light from the tooth back of a liquid crystal display panel is not used for this reflective mold liquid crystal display, it can reduce power consumption compared with a transparency mold liquid crystal display. For this reason, the reflective mold liquid crystal display is suitable as a display for pocket devices, and the reflective mold display of various methods is developed in recent years.

[0007] Although a reflective mold display has the above advantages compared with a transparency mold display, it has fear which is not easy to observe a display image under the environment where outdoor daylight is scarce. In order to solve such a problem, the reflective mold display using the front light which is a field-like lighting system is developed. The front light currently used for this reflective mold display has the light guide plate (field-like transparent material) which has translucency in the front face of a reflective mold display panel, and the light source arranged by approaching the periphery of this light guide plate, incidence of the light by which outgoing radiation is carried out from the light source is carried out into a light guide plate, and light is irradiated by the reflective mold display panel from the front face of a light guide plate.

[0008] In the reflective mold display equipped with the front light which is such a field-like lighting system, also under the environment where outdoor daylight is scarce, since the illumination light is irradiated by the display panel by turning on a front light, the image displayed can be checked by looking easily. Furthermore, under the environment where sufficient outdoor daylight exists, since a display image can be checked by looking through a light guide plate, without turning on the light source, it becomes possible to reduce power consumption.

[0009]

[Problem(s) to be Solved by the Invention] In the transparency mold liquid crystal display mentioned above, there is a problem that the outgoing radiation light from the back light arranged at the tooth back of a liquid crystal display panel is absorbed more than one half with the polarizing plate arranged at the optical incidence side of a liquid crystal display component. Therefore, in a transparency mold liquid crystal display, in order to raise the brightness of a display, it is necessary to make the illuminance of a back light high. In order to make the illuminance of a back light high, much power is needed and there is a problem that power consumption increases.

[0010] On the other hand, in a reflective mold liquid crystal display, under the environment where the outdoor daylight of sufficient quantity of light exists, since there is no need of turning on a front light, power consumption can be made low enough. Furthermore, under the environment where outdoor daylight is scarce, since light is irradiated by the display panel by turning on the light source of a front light, a display image can be checked by looking easily. However, also in a reflective mold liquid crystal display, since the outgoing radiation light from a front light is absorbed more than one half with the polarizing plate arranged at the optical incidence side of a liquid crystal display component, it has the problem that the use effectiveness of light is low, like the back light in a transparency mold liquid crystal display. Therefore, also in a reflective mold liquid crystal display, in order to raise the brightness of a display, it is necessary to make the illuminance of a front light high, therefore much power is needed. For this reason, low-power-ization of a front light is called for also in the reflective mold liquid crystal display.

[0011] In order to solve the problem that the power consumption of a back light which was mentioned above is large in a transparency mold liquid crystal display, to JP,9-258221,A The illumination light from the light source is separated in the two directions of the linearly polarized light in which plane of polarization intersects perpendicularly mutually, and after

carrying out 90-degree rotatory polarization of one linearly polarized light and making it in agreement with the plane of polarization of another side, the configuration using the polarization back light equipped with a means to make the light of both whose plane of polarization corresponded join is indicated. By such configuration, since the polarizing plate and plane of polarization which have been arranged at the optical incidence side of a liquid crystal display component are arranged, the optical loss for one polarizing plate does not arise, but the use effectiveness of illumination light of light improves.

[0012] Furthermore, the polarization back light which prepares polarization separation / recombination film, separates into the linearly polarized light the linearly polarized light and plane of polarization cross at right angles the illumination light from the light source mutually with this film, or divides the illumination light from the light source into the right-handed-rotation circular polarization of light and the circumference circular polarization of light of the left, is made to reflect one polarization with a reflecting plate, and is made in agreement with the optical outgoing radiation side side of a field-like transparent material in polarization of another side is indicated by JP,10-253830,A. By such configuration, since the polarizing plate and plane of polarization which have been arranged at the optical incidence side of a liquid crystal display component are arranged, the optical loss for one polarizing plate does not arise, but the use effectiveness of illumination light of light improves.

[0013] However, with the configuration indicated by above-mentioned JP,9-258221,A, although the use effectiveness of the light irradiated from a back light improves, since a means to separate light in the direction of the linearly polarized light, a means to polarize the polarization direction, a means to make light join, etc. are required for a back light, there is a problem that the size of a display becomes large.

[0014] Moreover, in this case, although it is possible to apply the back light indicated by JP,10-253830,A as a front light of a reflective mold liquid crystal display, since a display image is checked by looking through a light guide plate, polarization separation / recombination film must be prepared in the optical outgoing radiation side side of a transparent material, and there is a possibility that the visibility of a display image may get worse.

[0015] Furthermore, prism-like irregularity is prepared in the screen side of the transparent material in a front light, and the configuration which irradiates the light by which incidence was carried out to the transparent material from the light source to a display-panel side is indicated by JP,11-218757,A using the total reflection of the light in the slant surface part of the irregularity.

[0016] However, with this configuration, depending on the include angle and prism configuration of incident light which carry out incidence to a concavo-convex slant surface part, there is a possibility that light may be revealed to a screen side, and when light is revealed to a screen side, there is a problem that the visibility of a display image gets worse. Furthermore, since the specular reflection light by the front light laps in case a user observes the display light of a reflective mold liquid crystal display, there is also a problem that the contrast of a display image worsens.

[0017] This invention is made so that it may solve the technical problem of such a conventional technique, and when the use effectiveness of the light from the light source improves, it can attain low-power-ization, and it aims at offering further the reflective mold display using the front light and it whose visibility of a display image improves.

[0018]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the front light of the first this invention It is arranged so that incidence of the light by which outgoing radiation is carried out from the light source and this light source may be carried out to the interior from one side face. The light guide plate formed in the concave convex which has the steep incline section which reflects regularly with the gentle slope section which carries out total reflection of the light to which one front face is flat and total reflection of the front face of another side is carried out on a flat front

face, and carries out outgoing radiation from the front face of another side, The polarization means which makes light by which incidence is carried out to this light guide plate from this light source a predetermined polarization condition is provided.

[0019] According to the above-mentioned configuration, as shown in the gestalt 1 of operation mentioned later, incidence of the light by which outgoing radiation is carried out from the light source can be carried out into a light guide plate as a predetermined polarization condition with the polarization means established between a light guide plate and the light source. The design for optimizing the shape of tothing of the shape of prism prepared in the side (screen side) to which incidence of the outdoor daylight of a light guide plate is carried out compared with the case where incidence of the general light source light whose polarization condition is not fixed is carried out into a light guide plate becomes easy. That is, in order for what is necessary to be to take into consideration in this case only when incident light is in a specific polarization condition, that design becomes easy and leakage light by the side of the screen which performs an optimization design and is produced depending on the include angle and prism configuration of incident light to the slant surface part of a light guide plate can be lessened. Consequently, it can prevent originating in leakage light and the visibility of a display image falling. Furthermore, within a light guide plate, since it goes on while incident light had maintained plane of polarization, outgoing radiation of the predetermined polarization can be carried out from a light guide plate. therefore, the thing made in agreement [ the plane of polarization of a polarizing plate and the polarization shaft of predetermined polarization which were prepared in the optical incidence side of a reflective mold display panel ] -- predetermined polarization -- the use effectiveness of light can be raised to a display, using all for almost.

[0020] Incidence of the linearly polarized light can be carried out to a light guide plate by using the polarization means which makes light which carries out incidence to said light guide plate from said light source the linearly polarized light as said polarization means.

[0021] the light to which incidence of the front light of the second this invention is carried out from the point light source and this point light source -- a uniform line -- with the guide rod which changes into light and carries out incidence to this light guide plate It is arranged so that incidence of the light from this guide rod may be carried out to the interior from one side face. The light guide plate formed in the concave convex which has the steep incline section which reflects regularly with the gentle slope section which carries out total reflection of the light to which one front face is flat and total reflection of the front face of another side is carried out on a flat front face, and carries out outgoing radiation from the front face of another side, The polarization means which makes light by which incidence is carried out to this light guide plate from this guide rod a predetermined polarization condition is provided.

[0022] According to the above-mentioned configuration, as shown in the gestalt 2 of operation mentioned later, by the guide rod, homogeneity Guanghua of the light by which outgoing radiation is carried out from the point light source can be carried out like the light from a linear light source, and incidence can be carried out to a light guide plate. Furthermore, incidence of the light by which incidence is carried out through a guide rod with the polarization means established between the light guide plate and the guide rod from the point light source can be carried out into a light guide plate as a predetermined polarization condition. The design for optimizing the shape of tothing of the shape of prism formed in the side (screen side) to which incidence of the outdoor daylight of a light guide plate is carried out compared with the case where incidence of the general light source light whose polarization condition is not fixed is carried out into a light guide plate becomes easy, and leakage light by the side of the screen which performs an optimization design and is produced depending on the include angle and prism configuration of incident light to the slant surface part of a light guide plate can be lessened. Consequently, it can prevent originating in leakage light and the visibility of a display image falling. Furthermore, within a light guide plate, since it goes on while incident light had maintained plane of polarization, outgoing



radiation of the predetermined polarization can be carried out from a light guide plate. Therefore, the use effectiveness of light can be raised to a display using most predetermined polarization by making in agreement the plane of polarization of a polarizing plate and the optical axis of predetermined polarization which were prepared in the optical incidence side of a reflective mold display panel.

[0023] the light to which incidence of the front light of the third this invention is carried out from the point light source and this point light source -- a uniform line -- with the guide rod which changes into light and carries out incidence to this light guide plate. It is arranged so that incidence of the light from this guide rod may be carried out to the interior from one side face. The light guide plate formed in the concave convex which has the steep incline section which reflects regularly with the gentle slope section which carries out total reflection of the light to which one front face is flat and total reflection of the front face of another side is carried out on a flat front face, and carries out outgoing radiation from the front face of another side. The polarization means which makes light by which incidence is carried out to this guide rod from this point light source a predetermined polarization condition is provided.

[0024] According to the above-mentioned configuration, as shown in the gestalt 3 of operation mentioned later, by the guide rod, homogeneity Guanghua of the light by which outgoing radiation is carried out from the point light source can be carried out like a linear light source, and incidence can be carried out to a light guide plate. Furthermore, incidence of the light by which incidence is carried out through a guide rod with the polarization means established between the point light source and a guide rod from the point light source can be carried out into a light guide plate as a predetermined polarization condition. The design for optimizing the shape of toothing of the shape of prism formed in the side (screen side) to which incidence of the outdoor daylight of a light guide plate is carried out compared with the case where incidence of the general light source light whose polarization condition is not fixed is carried out into a light guide plate becomes easy, and leakage light by the side of the screen which performs an optimization design and is produced depending on the include angle and prism configuration of incident light to the slant surface part of a light guide plate can be lessened. Consequently, it can prevent originating in leakage light and the visibility of a display image falling. Furthermore, within a light guide plate, since it goes on while incident light had maintained plane of polarization, outgoing radiation of the predetermined polarization can be carried out from a light guide plate. Therefore, the use effectiveness of light can be raised to a display using most predetermined polarization by making in agreement the plane of polarization of a polarizing plate and the optical axis of predetermined polarization which were prepared in the optical incidence side of a reflective mold display panel. Furthermore, things other than the shape of tabular or a film can be used like a beam splitter as a polarization means for acquiring predetermined polarization.

[0025] The reflected light reflected by this reflective mold polarizing plate is changed by this polarization conversion means, and re-incidence is carried out to this reflective mold polarizing plate by being able to make the predetermined linearly polarized light able to penetrate as said polarization means, being able to use the reflective mold polarizing plate made to reflect other light, and preparing a polarization conversion means change further the reflected light reflected by this reflective mold polarizing plate into random light or the light which carried out 90 degree rotatory polarization.

[0026] Since according to the above-mentioned configuration the light reflected by the reflective mold polarizing plate can be changed with a polarization conversion means, re-incidence can be carried out to a reflective mold polarizing plate and it can use, the brightness of the predetermined linearly polarized light by which incidence is carried out to a light guide plate can be made high, and the use effectiveness of light can be raised.

[0027] As said polarization conversion means, re-incidence of the random light can be carried out to a reflective mold polarizing plate by forming a scattered plate. Or re-incidence of the light to which 90-degree rotatory polarization of the reflected light was carried out can be carried out to a reflective mold polarizing plate by forming a quarter-wave length

plate and a reflecting plate as said polarization conversion means.

[0028] As said polarization means, a cholesteric-liquid-crystal film, a quarter-wave length plate, and a polarizing plate can be used. The predetermined circular polarization of light which penetrated this cholesteric-liquid-crystal film is made into the predetermined linearly polarized light with this quarter-wave length plate and this polarizing plate. By forming the reflecting plate which reflects in this cholesteric-liquid-crystal film side the light reflected by this cholesteric-liquid-crystal film After the light reflected by this cholesteric-liquid-crystal film is reflected with this reflecting plate and the hand of cut of the circular polarization of light is changed, this cholesteric-liquid-crystal film is penetrated and re-incidence is carried out to this quarter-wave length plate and this polarizing plate.

[0029] Since according to the above-mentioned configuration a cholesteric-liquid-crystal film can be made to be able to penetrate, re-incidence can be carried out to a quarter-wave length plate and a polarizing plate and it can use by reflecting the light reflected by the cholesteric-liquid-crystal film with a reflecting plate, and reversing a hand of cut, the brightness of the predetermined linearly polarized light by which incidence is carried out to a light guide plate can be made high, and the use effectiveness of light can be raised.

[0030] Incidence of the light by which parallel Guanghua was carried out can be carried out to a light guide plate by establishing the condensing means for carrying out parallel Guanghua of the light to the optical incidence side of said polarization means. Since the incident angle of the thickness direction of a light guide plate can be narrowed down, while being able to improve the use effectiveness of light, the design for optimizing a prism configuration becomes easy.

[0031] As said polarization means, the beam splitter which carries out polarization separation of the light from said light source at the transmitted light and the reflected light can be used. The reflecting plate which incidence of the predetermined polarization which penetrated this beam splitter is carried out to said guide rod, and is made to reflect further the reflected light reflected in this beam splitter in the direction of this guide rod, By establishing a polarization conversion means to change into the same linearly polarized light as the transmitted light the light reflected in this reflected light It is reflected in this guide rod direction by this reflecting plate, the reflected light reflected in this beam splitter is changed into the same linearly polarized light as the transmitted light by this polarization conversion means, and incidence is carried out to this guide rod. Or the reflected light reflected in this beam splitter is changed with this polarization conversion means, it changes into the same linearly polarized light as the transmitted light, and the changed light may be reflected in this guide rod direction with this reflecting plate, and incidence may be carried out to this guide LLoyd's. Since incidence of the light with the high degree of polarization separated by the beam splitter can be carried out to a light guide plate through a guide rod according to the above-mentioned configuration, the use effectiveness of light can be raised.

[0032] Since 90-degree rotatory polarization of the reflected light reflected in the beam splitter by forming  $1/2$  wavelength plate as said polarization conversion means is carried out, it can change into the same linearly polarized light as the transmitted light and incidence can be carried out to a light guide plate, the use effectiveness of light can be raised.

[0033] Incidence of the light by which parallel Guanghua was carried out can be carried out to a guide rod and a light guide plate by establishing the condensing means for carrying out parallel Guanghua of the light to the optical incidence side of said polarization means. Since the incident angle of a guide rod and the thickness direction of a light guide plate can be narrowed down, while being able to improve the use effectiveness of light, the design for optimizing a prism configuration becomes easy.

[0034] the light by which incidence is carried out to a light guide plate by preparing the concave heights for equalizing the incident light to said light guide plate in either [ at least ] the field by the side of said light guide plate in said guide rod, or the field of the opposite side -- a uniform line -- it can consider as light.

[0035] the light to which incidence of the front light of the fourth this invention is carried out from the point light source and this point light source -- a uniform line -- with the guide rod changed and outputted to light It is arranged so that incidence of the light from this guide rod may be carried out to the interior from one side face. One front face is flat and the light guide plate formed in the concave convex which has the steep incline section which the front face of another side reflects regularly with the gentle slope section which carries out total reflection of the light by which total reflection is carried out on a flat front face, and carries out outgoing radiation from the front face of another side is provided. This guide rod has the polarization function incidence of the light from this point light source is carried out [ function ] to this light guide plate as a predetermined polarization condition.

[0036] According to the above-mentioned configuration, as shown in the gestalt 4 of operation mentioned later, by the guide rod, homogeneity Guanghua of the light by which outgoing radiation is carried out from the point light source can be carried out like a linear light source, and incidence can be carried out to a light guide plate. Furthermore, by the guide rod itself, since incidence of the light by which incidence is carried out through a guide rod from the point light source can be carried out into a light guide plate as a predetermined polarization condition, components mark can be reduced compared with the 1st - the 3rd this invention. The design for optimizing the shape of toothing of the shape of prism formed in the side (screen side) to which incidence of the outdoor daylight of a light guide plate is carried out compared with the case where incidence of the general light source light whose polarization condition is not fixed is carried out into a light guide plate becomes easy, and leakage light by the side of the screen which performs an optimization design and is produced depending on the include angle and prism configuration of incident light to the slant surface part of a light guide plate can be lessened. Consequently, it can prevent originating in leakage light and the visibility of a display image falling. Furthermore, within a light guide plate, since it goes on while incident light had maintained plane of polarization, the use effectiveness of light can be raised to a display using most predetermined polarization by being able to carry out outgoing radiation of the predetermined polarization from a light guide plate, and making in agreement the plane of polarization of a polarizing plate and the optical axis of predetermined polarization which were prepared in the optical incidence side of a reflective mold display panel.

[0037] While two or more translucency transparent materials which have the inclined plane which inclined at an angle of predetermined to the direction of optical incidence as said guide rod, respectively join the inclined planes and they are constituted, the polarization function for acquiring predetermined polarization can be given to the guide rod itself by using what was constituted so that light from said point light source might be made into the predetermined linearly polarized light. Or while two or more translucency transparent materials which have the inclined plane which inclined at an angle of predetermined to the direction of optical incidence as said guide rod, respectively join the inclined planes and they are constituted Have the rod object of the pair constituted so that light from said point light source might be made into the predetermined linearly polarized light, have become in the direction in which the inclination direction of the inclined plane of the translucency transparent material in each rod object conflicts, and each rod object is received. When the light from the point light source uses that by which incidence is carried out, respectively, the polarization function for acquiring predetermined polarization can be given to the guide rod itself.

[0038] As said light source, low-power-ization can be attained by using light emitting diode (LED) compared with the case where a cold cathode tube is used. Furthermore, since luminescence which consists of a specific spectrum is obtained [ unlike the cold cathode tube containing two or more emission spectrums ] according to LED, the design for optimizing the design for optimizing the prism configuration on the front face of a light guide plate and the polarization function of a guide rod becomes easy.

[0039] In the periphery of said light guide plate, by forming a reflecting plate in at least one side face other than said light



source or said guide rod, and the side face which counters, the leakage light from a light guide plate side face can be decreased, and the use effectiveness of light can be raised.

[0040] Compared with the case where a general light source light whose polarization condition is unspecified is made to penetrate, reduction of the brightness after polarizing plate transparency can be lessened by preparing a polarizing plate in the optical outgoing radiation side of said light guide plate, and making in agreement the polarization shaft and plane of polarization of the predetermined polarization by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate.

[0041] By preparing a polarizing plate in the outdoor daylight plane-of-incidence side (screen side) of said light guide plate, and making in agreement the polarization shaft and plane of polarization of the predetermined polarization by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate, unnecessary leakage light by the side of the screen can be lessened, and the visibility of a display image can be raised. Or also when a polarizing plate and a phase contrast plate are formed in the outdoor daylight plane-of-incidence side of said light guide plate and the polarization shaft of the predetermined polarization by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate, and the polarization shaft of the polarization which is made to pass this polarizing plate and this phase contrast plate, and is acquired in outdoor daylight are in agreement, an unnecessary leakage light by the side of the screen can be decreased.

[0042] By preparing a polarizing plate in the outdoor daylight plane-of-incidence side (screen side) of said light guide plate, and making the predetermined polarization and plane of polarization by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate intersect perpendicularly, unnecessary leakage light by the side of the screen can be lessened further, and the visibility of a display image can be raised. With this configuration, the display function which reversed the negative positive can be obtained from the light source by the case where the illumination light by which outgoing radiation is carried out through a light guide plate is used, and the case where outdoor daylight is used.

[0043] The reflective mold display of this invention has the front light and reflective mold display panel of this invention, and can be displayed by irradiating the light or outdoor daylight by which outgoing radiation was carried out from this front light at this reflective mold display panel.

[0044] Furthermore, prepare a polarizing plate in the outdoor daylight plane-of-incidence side (screen side) of said light guide plate, and it sets in the configuration which made the polarization shaft and plane of polarization of the predetermined polarization by which outgoing radiation is carried out from the optical outgoing radiation side of this light guide plate intersect perpendicularly. By reversing the driving signal at the time of displaying using the outgoing radiation light from a front light, and the driving signal at the time of displaying using outdoor daylight The display whose negative positive corresponded can be obtained from the light source by the case where the illumination light by which outgoing radiation is carried out through a light guide plate is used, and the case where outdoor daylight is used.

[0045] Since the display light and specular reflection light which were reflected by the reflective mold display panel by carrying out incidence are not mixed as shown in the gestalt 5 of operation later mentioned by irradiating said reflective mold display panel and reflecting the light or outdoor daylight by which outgoing radiation was carried out from said front light in the direction [ specular reflection ] shifted, the fall of contrast is controlled and the visibility of a display image can be raised.

[0046] In said reflective mold display panel, a reflective mold hologram can be used as a means to reflect the light or outdoor daylight by which outgoing radiation was carried out from said front light in the direction [ specular reflection ] shifted. Or the reflecting plate which prepared two or more inclined planes made to incline to the screen can be used.

[0047]

[Embodiment of the Invention] Below, the gestalt of operation of this invention is explained based on a drawing.

[0048] (Gestalt 1 of operation) Drawing 1 is a perspective view for explaining the outline configuration of the front light which is 1 operation gestalt of this invention. This front light 10 has the light guide plate 12 constituted with translucency resin, such as acrylic resin and polycarbonate resin.

[0049] Drawing 2 is the important section sectional view of a light guide plate 12. Irregularity is prepared in one front face of a light guide plate 12. The irregularity prepared in the front face of a light guide plate 12 has two or more 2nd slant-face (steep incline) 12b which has been arranged, respectively between two or more 1st slant-face (gentle slope) 12a parallel to mutual by which each opened suitable spacing and has been arranged along the cross direction of a light guide plate 12, and adjoining 1st slant-face 12a and which became parallel to mutual. Each 2nd slant-face 12b inclines in the opposite direction with 1st slant-face 12a by whenever [ bigger tilt-angle / than 1st slant-face 12a ]. The rear face of a light guide plate 12 is flat illumination-light outgoing radiation side 12c. The linear light source 11 of the shape of a cylinder from which the side face was countered and which while the side of a light guide plate 12 was met crosswise consisted of with the cold cathode tube etc. is arranged.

[0050] Drawing 3 is the sectional view of the linear light source 11 in a front light 10, and its perimeter. The reflective polarization film 14 is formed in the side face of the light guide plate 12 which countered the linear light source 11 over the whole surface, and the laminating of the prism sheet 13 as a condensing means is carried out to this reflective polarization film 14. Furthermore, the dispersion reflecting plate 15 is formed so that the perimeter of a linear light source 11 may be enclosed, and the light which goes in the direction which outgoing radiation is carried out from a linear light source 11, and is different in a light guide plate 12 is scattered about with the dispersion reflecting plate 15, and is reflected in the light guide plate 12 direction. Moreover, as shown in drawing 1, the reflecting plate 16 is respectively formed in other three side faces except the linear light source 11 in a light guide plate 12, and the side face which countered in the condition of having made the reflector countering each side face of a light guide plate 12.

[0051] Drawing 4 is the sectional view showing the outline configuration of the reflective mold display with which the front light of such a configuration was prepared, and which is 1 operation gestalt of this invention. The light guide plate 12 of the front light 10 which shows this reflective mold display to the outdoor daylight incidence side (screen side) of the reflective mold display panel 20 at drawing 1 is arranged. The front face in which irregularity was prepared is turned to the opposite side in the reflective mold display panel 20, and outdoor daylight carries out incidence of the light guide plate 12 to the front face. The 2nd substrate 22 which has the translucency arranged in the opposite side opens predetermined spacing, and is arranged by the 1st substrate 21 which has the translucency arranged at the screen side whose reflective mold display panel 20 is the incidence side of outdoor daylight, and the screen side. In the gap of both the substrates 21 and 22, the electrooptic material 23, such as liquid crystal, is held and the translucency electrodes 24 and 25 for impressing an electrical potential difference to electrooptic material 23 are respectively formed in the front face by the side of the electrooptic material 23 in each substrates 21 and 22. With the electrode forming face of the 2nd substrate 22, on the surface of the opposite side, a reflecting plate 26 makes a reflector counter the 2nd substrate 22, and is formed. Furthermore, the quarter-wave length plate 28 is formed in the screen of the 1st substrate 21, and the polarizing plate 27 is formed in this quarter-wave length plate 28.

[0052] In such a reflective mold display, in displaying an image, in order to change the electro-optics property of the predetermined field in electrooptic material 23, an electrical potential difference is impressed to the translucency electrodes 24 and 25. Thereby, the electro-optics property of electrooptic material 23 changes. In this case, outdoor daylight is carrying out incidence to the reflective mold display panel 20 through the light guide plate 12 of a front light 10,

and that incident light penetrates the electrooptic material 23 from which the electro-optics property changed, and is reflected with a reflecting plate 26. And the reflected light can check by looking as a display image the quarter-wave length plate 28 and a polarizing plate 27, and by carrying out outgoing radiation through the light guide plate 12 of a front light 10 further. On the other hand, in case a display image is checked by looking, when outdoor daylight is scarce, the linear light source 11 of a front light 10 is turned on. In this case, as shown in drawing 2, the light source light 31 by which outgoing radiation is carried out from a linear light source 11 is in a random polarization condition, it is reflected by the direct or dispersion reflecting plate 15, it penetrates the prism sheet 13 as a condensing means, and incidence is carried out to the reflective polarization film 14 as a polarization means. Among this incident light, only P polarization component 32 penetrates the reflective polarization film 14, incidence is carried out to a light guide plate 12, and S polarization component 33 which intersects perpendicularly with P polarization component is reflected in the light source 11 direction by the reflective polarization film 14. S polarization components 33 reflected in the light source 11 direction are scattered about with the dispersion reflecting plate 15 as a polarization conversion means, or the cold cathode tube of a linear light source 11, and are changed into the light (random light) of a random polarization condition, and re-incidence is carried out to the reflective polarization film 14. And incidence only of the P polarization component 35 is carried out to a light guide plate 12 among the re-incident light 34 with the reflective polarization film 14.

[0053] Total reflection of the light which penetrated the reflective polarization film 14 and carried out incidence to the light guide plate 12 is carried out by 1st slant-face 12a of the front face in which irregularity was prepared, and illumination-light outgoing radiation side 12c on the back, and it advances the inside of a light guide plate 12 by them. If the advancing light carries out incidence of the inside of a light guide plate 12 to surface 2nd slant-face 12b at this time, without a travelling direction's changing and carrying out total reflection in illumination-light outgoing radiation side 12c, since specular reflection is carried out in 2nd slant-face 12b, illumination-light outgoing radiation side 12c will be penetrated, and outgoing radiation will be carried out as illumination light. Since the light which advances the inside of a light guide plate 12 advances the inside of a light guide plate 12 by the repeat of the total reflection by 1st slant-face 12a and illumination-light outgoing radiation side 12c, plane of polarization has been maintained by it.

[0054] Thus, incidence of the illumination light which changed into the condition almost near the linearly polarized light is carried out to the polarizing plate 27 prepared so that the polarization shaft and plane of polarization of the illumination light might be in agreement. Thereby, most light by which outgoing radiation was carried out from the light guide plate 12 as illumination light is used in order to check a display image by looking. Consequently, the use effectiveness of the light by which outgoing radiation is carried out from a front light 10 improves remarkably.

[0055] In addition, although the linear light source 11 of the shape of a cylinder arranged along the side face of a light guide plate 12 was used in the front light 10 of the gestalt 1 of this operation, it can replace with this configuration, and as shown in drawing 5, two or more LED (light emitting diode)51 which is the point light source can also be used. In this case, each LED51 opens suitable spacing, counters the side face of a light guide plate 12, and is arranged. Thus, low-power-ization can be attained by using two or more LED51.

[0056] Furthermore, although the dispersion reflecting plate 15 which encloses a linear light source 11 as a polarization conversion means was used, as shown in drawing 5, the quarter-wave length plate 52 arranged so that the side face of a light guide plate 12 may be countered between adjoining LED51, and the light guide plate 12 of this quarter-wave length plate 52 may use the reflecting plate 53 by which the laminating was carried out to the opposite side. Thus, by using the quarter-wave length plate 52 and a reflecting plate 53 as a polarization conversion means, it can change into the light which carried out 90-degree rotatory polarization of the light reflected by the reflective polarization film 14, and re-incidence can be carried out to the reflective polarization film 14. In this case, compared with the case where a



dispersion reflecting plate is used, the illumination light which has higher degree of polarization can be obtained.

[0057] (Gestalt 2 of operation) Drawing 6 is a perspective view for explaining the outline configuration of the front light which are other operation gestalten of this invention. This front light 60 has the transparent material 12 of the same configuration as the gestalt 1 of operation. A side face is countered and the guide rod 62 is arranged for while the side of a transparent material 12 was met crosswise along the side face. This guide rod 62 is constituted by translucency resin, such as acrylic resin and polycarbonate resin, in the shape of a cross-section square, and LED51 which is the point light source is arranged at each end face, respectively. The light by which outgoing radiation is carried out from each point light source 51, and incidence is carried out to a guide rod 62 is changed into a uniform linear light source by the guide rod 62, and is irradiated by the side face of the light guide plate 12 which countered the guide rod 62.

[0058] The reflective polarization film 14 is formed in the side face of a light guide plate 12 in which the light from a guide rod 62 is irradiated, over the whole surface, and the laminating of the prism sheet 13 as a condensing means is carried out to this reflective polarization film 14. Furthermore, the dispersion reflecting plate 66 is formed so that the perimeter of a guide rod 62 may be enclosed, and the light which incidence is carried out to a guide rod 62 from the point light source 51, and advances the inside of a guide rod 62 is scattered about, and it is reflected toward a light guide plate 12. Moreover, the reflecting plate 16 is respectively formed in other three side faces except the guide rod 62 in a light guide plate 12, and the side face which countered in the condition of having made the reflector counteracting each side face of a light guide plate 12.

[0059] Drawing 7 is the flat section of the point light source 51 in a front light 60, and its perimeter. In the side face which countered the light guide plate 12 of the guide rod 62 in a front light 60, V groove 62a constituted in the shape of [ two or more ] a cross section of V characters is arranged along the vertical direction, respectively, where suitable spacing for a longitudinal direction is opened. The side face of a guide rod 62 in which V slot each 62a was prepared is dispersion transparency section 62b of light except for V slot each 62a. Moreover, the side face which counters the side face of a guide rod 62 in which V slot each 62a was prepared is crossed to the whole surface, and has become scatter reflection section 62c which reflects light in the state of dispersion.

[0060] The front light 60 of such a configuration is arranged so that a light guide plate 12 may be located on the polarizing plate 27 by the side of the outdoor daylight incidence of the reflective mold display panel 20 shown in drawing 2 (screen side), and it constitutes a reflective mold display.

[0061] In such a reflective mold display, incidence of the light source light by which outgoing radiation was carried out from the point light source 51 of a front light 60 is carried out to a guide rod 62 in the state of random polarization. It is reflected by direct or V groove 62a, and incidence of the light by which incidence was carried out to the guide rod 62 is carried out to V groove 62a at scatter reflection section 62c of the side face which counters. And the light reflected in this scatter reflection section 62c penetrates dispersion transparency section 62b in the state of dispersion. The light which penetrated dispersion transparency section 62b penetrates the prism sheet 13 as a condensing means, and incidence is carried out to the reflective polarization film 14 as a polarization means. Among this incident light, only P polarization component penetrates the reflective polarization film 14, incidence is carried out to a light guide plate 12, and S polarization component which intersects perpendicularly with P polarization component is reflected in the guide rod 62 direction by the reflective polarization film 14. Dispersion transparency section 62b is penetrated, it is reflected in scatter reflection section 62c as a polarization conversion means, S polarization component reflected in the guide rod 62 direction is changed into the light (random light) of a random polarization condition, and re-incidence is carried out to the reflective polarization film 14. And incidence only of the P polarization component is carried out into a light guide plate 12 among re-incident light with the reflective polarization film 14.

[0062] The light which penetrated the reflective polarization film 14 and carried out incidence into the light guide plate 12 is in the gestalt 1 of operation, and the condition that plane of polarization was maintained similarly, and outgoing radiation is carried out as illumination light from illumination-light outgoing radiation side 12c. And incidence of the illumination light which changed into the condition almost near the linearly polarized light is carried out to the polarizing plate 27 prepared so that the polarization shaft and plane of polarization of the illumination light might be in agreement. Thereby, most light by which outgoing radiation was carried out as illumination light can use in order to check a display image by looking.

[0063] In addition, although the light which made light by which incidence is carried out to a light guide plate 12 from a guide rod 62 using the reflective polarization film 14 the predetermined linearly polarized light, and was reflected with the reflective polarization film 14 was changed into random light in scatter reflection section 62c with the gestalt 2 of this operation. It can replace with this configuration, and as shown in drawing 8, the layered product which carried out the laminating of the cholesteric-liquid-crystal film 84 as a polarization means, and the quarter-wave length plate 85 and polarizing plate 86 as a polarization conversion means one by one can also be used. The laminating of the polarizing plate 86 is carried out to the side face of a light guide plate 12, and, as for a layered product, the liquid crystal film 84 counters a guide rod 62.

[0064] In this case, incidence of the predetermined circular polarization of light which penetrated the cholesteric-liquid-crystal film 84 is carried out to the quarter-wave length plate 85 and a polarizing plate 86, and incidence is carried out to a light guide plate 12 as the predetermined linearly polarized light. Furthermore, it is reflected by a light guide plate 12 and the reflecting plate 16 formed in the side face of the guide rod 62 which counters, the reflected light reflected by the cholesteric-liquid-crystal film 84 penetrates the cholesteric-liquid-crystal film 84, and re-incidence is carried out to the quarter-wave length plate 85 and a polarizing plate 86. Thus, finally incidence of the predetermined linearly polarized light can be carried out to a light guide plate 12, and the illumination light which has higher degree of polarization can be obtained. And since the brightness of the light which has a predetermined polarization condition in this case compared with the case where scatter reflection section 62c is used can be made high, the use effectiveness of light can be raised.

[0065] (Gestalt 3 of operation) Drawing 9 is a plan for explaining the outline configuration of the front light which are other operation gestalten of this invention. This front light 90 has the same transparent material 12 as the gestalt 1 of operation. The wedge-action-die transparent material 96 as a guide rod which changes the light from the point light source into a uniform linear light source, and carries out incidence to a light guide plate counters the side face of a transparent material 12, and is arranged. This wedge-action-die transparent material 96 is constituted by translucency resin, such as acrylic resin and polycarbonate resin. the light guide pair to which the wedge-action-die transparent material 96 is stuck covering the whole side face of the transparent material 12 which counters and which the side face by the side of the distant place of a transparent material 12 counters -- being inclined to the side face of 12. And the sloping side face is mostly in agreement with the side face of the light guide plate 12 which counters in one edge, and, thereby, the flat-surface configuration has become a wedge action die.

[0066] LED51 which is the point light source is arranged through the beam splitter 93 and the prism sheet 92 at the end face of the wedge-action-die transparent material 96. Also directly, a beam splitter 92 divides the light irradiated from LED51 into P polarization which carries out incidence into the wedge-action-die transparent material 96, and S polarization which acts as a user toward the direction which separates from a light guide plate 12. The reflecting plate 94 made to reflect S polarization separated by the beam splitter 93 so that the end face of the wedge-action-die transparent material 96 may be irradiated is formed in the side of a beam splitter 92 in the condition of having inclined to the end face

of the wedge-action-die transparent material 94. Moreover, 1/2 wavelength plate 95 for carrying out polarization conversion of the light reflected with the reflecting plate 94 is formed in the end face of a reflecting plate 94 and the wedge-action-die transparent material 94 which counters.

[0067] Drawing 10 is the flat section of the point light source 51 in a front light 90, and its perimeter. In the side face arranged in the state of an inclination at the distant place side of the light guide plate 12 in the wedge-action-die transparent material 96 While flat-surface section 96a parallel to a light guide plate 12 and the side face which counters vacates suitable spacing and is arranged Two or more slant surface part 96b from which the include angle with each flat-surface section 96a to make became 135 degrees is prepared among adjoining flat-surface section 96a, and irregularity is formed of these flat-surfaces section 96a and slant surface part 96b.

[0068] The front light 60 of such a configuration is also arranged so that a light guide plate 12 may be located on the polarizing plate 27 by the side of the outdoor daylight incidence of the reflective mold display panel 20 shown in drawing 2 (screen side), and it constitutes a reflective mold display.

[0069] In such a reflective mold display, incidence of the light source light by which outgoing radiation was carried out from LED51 which is the point light source is carried out to the prism sheet 92 in the state of random polarization, it is changed into an almost parallel light, incidence is carried out to a beam splitter 93, and polarization separation is carried out at P polarization and S polarization. Incidence of the P polarization is carried out to the wedge-action-die transparent material 96 which penetrates a beam splitter 93 and has translucency, and S polarization is reflected in the 90-degree direction ( drawing 10 left-hand side) by the beam splitter 93 to the direction of incidence. It is reflected by the reflecting plate 94 toward the end face of the wedge-action-die transparent material 96, 90-degree rotatory polarization of the S polarization reflected by the beam splitter 93 is carried out by 1/2 wavelength plate 95 as a polarization conversion means, and incidence is carried out into the wedge-action-die transparent material 96.

[0070] While repeating total reflection, respectively and going on according to flat-surface section 96a in the side face which changed into the inclination condition by the side of the distant place of a light guide plate 12, and a light guide plate 12 and the side face which counters, specular reflection of the light which carried out incidence into the wedge-action-die transparent material 96 is carried out, it passes along the side face which counters a light guide plate 12, and incidence is carried out into a light guide plate 12 by slant surface part 96b arranged among each flat-surface section 96a. Thus, while plane of polarization had been maintained, outgoing radiation of the light by which incidence was carried out to the light guide plate 12 is carried out from illumination-light outgoing radiation side 12c. And incidence of the illumination light which changed into the condition almost near the linearly polarized light is carried out to the polarizing plate 27 prepared so that the polarization shaft and plane of polarization of the illumination light might be in agreement. Thereby, most light by which outgoing radiation was carried out as illumination light is used in order to check a display image by looking.

[0071] In addition, although it considered as the configuration which changes into the same polarization (P polarization) as the transmitted light with 1/2 wavelength plate 95, and carries out re-incidence to the wedge-action-die transparent material 96 with the gestalt 3 of this operation after reflecting S polarization reflected by the beam splitter 93 toward the end face of the wedge-action-die transparent material 96 with a reflecting plate 94 It replaces with this configuration, and after changing into the same polarization (P polarization) as the transmitted light S polarization reflected by the beam splitter 93 with 1/2 wavelength plate 95, it may be made to carry out re-incidence into the wedge-action-die transparent material 96 with a reflecting plate 94.

[0072] In the gestalt 3 of this operation, since the illumination light by which outgoing radiation is carried out from a front light 90 is the linearly polarized light with degree of polarization higher than the gestalt 2 of operation, as shown in



drawing 11 , it may form a polarizing plate 29 in a screen side instead of the polarizing plate 27 prepared in the illumination-light outgoing radiation side side. In this case, since only the same linearly polarized light as the illumination light is penetrated at a screen side by making in agreement the polarization shaft of the predetermined linearly polarized light by which outgoing radiation is carried out from the light guide plate 12 of a front light 90, and the plane of polarization of a polarizing plate 29, it is controlled that an unnecessary light which is not related to a display is revealed to a screen side, and it can obtain the high display image of contrast.

[0073] Moreover, since the leakage light by the side of the screen can be reduced also by forming a polarizing plate and a phase contrast plate in a screen side, and setting up so that the predetermined linearly polarized light by which outgoing radiation is carried out from the light guide plate 12 of a front light 90, and the polarization which is made to pass a polarizing plate and a phase contrast plate, and is acquired in outdoor daylight may be in agreement, the high display image of contrast can be obtained.

[0074] Furthermore, when a polarizing plate is prepared in a screen side, only the predetermined linearly polarized light and the linearly polarized light the linearly polarized light and a polarization shaft cross at right angles are penetrated at a screen side by setting up so that the polarization shaft of the predetermined linearly polarized light by which outgoing radiation is carried out from the light guide plate 12 of a front light 90, and the plane of polarization of a polarizing plate may intersect perpendicularly. Since the light by which direct outgoing radiation is carried out by this to a screen side, without carrying out outgoing radiation to the reflective mold display-panel 20 side from the light guide plate 12 of a front light 90 can be intercepted, it is controlled that an unnecessary light which is not related to a display is revealed to a screen side, and it can obtain a display image with still higher contrast.

[0075] Moreover, with this configuration, since outdoor daylight penetrates a polarizing plate and is irradiated by the reflective mold display panel, when outdoor daylight is used, in order to display an image, the linearly polarized light which intersects perpendicularly with the illumination light is used. Therefore, the display image which the negative and the positive reversed is obtained by the case where an image is displayed using the illumination light from the light guide plate 12 of a front light 90, and the case where an image is displayed using outdoor daylight. In addition, also when using which light by reversing the driving signal impressed to an electrode in case an image is displayed using the illumination light, and the driving signal impressed to an electrode in case an image is displayed using outdoor daylight, the display image the negative image and whose positive image corresponded can also be obtained.

[0076] Furthermore, when a polarizing plate is prepared in a screen side (forefront side of a reflective mold display), rebound ace court processing of the screen which is used in the conventional reflective mold display, nonreflective coat processing, a touch panel technique, etc. can be used as it is.

[0077] (Gestalt 4 of operation) Drawing 12 is a top view for explaining the outline configuration of the front light which are other operation gestalten of this invention. This front light 120 has the same transparent material 12 as the gestalt 1 of operation. A side face is countered and the guide rod 123 is arranged for while the side of a transparent material 12 was met crosswise. This guide rod 123 has translucency transparent material 123a of the letter of a block constituted with acrylic resin, polycarbonate resin, etc., as shown in drawing 13 . Each translucency transparent material 123a has the inclined plane which inclined at 45 degrees to the side face of a light guide plate 12, respectively, and let it be the cross-section square-like guide rod 123 by pasting up the inclined planes prepared in each translucency transparent material 123a by adhesives 123b.

[0078] Also in the guide rod 123, LED51 which is the point light source is arranged through the prism sheet 122 at the end face. The light irradiated from LED51 is changed into parallel light by the prism sheet 122, and incidence is carried out into a guide rod 123 with it. Moreover, the quarter-wave length plate 125 is formed in the point light source 51 and the

other-end side of the guide rod 123 which countered, and the laminating of the reflecting plate 126 is carried out to the outside. Furthermore, the reflecting plate 16 is formed in the side face of the opposite side of the guide rod 123 in a light guide plate 12, other three side faces except the side face which countered, and the light guide plates 12 in a guide rod 123 and the side faces which countered, respectively. As for each reflecting plate 16, the reflector has countered each side face of a light guide plate 12 and a guide rod 123.

[0079] The front light 120 of such a configuration is also arranged so that a light guide plate 12 may be located on the polarizing plate 27 by the side of the outdoor daylight incidence of the reflective mold display panel 20 shown in drawing 2 (screen side), and it constitutes a reflective mold display.

[0080] In such a reflective mold display, incidence of the light source light by which outgoing radiation was carried out from LED51 which is the point light source is carried out to the prism sheet 122 in the state of random polarization, it is changed into an almost parallel light and incidence is carried out to a guide rod 62. Among the light by which incidence was carried out to the guide rod 123, it is reflected in the interface of each translucency transparent material 123a and adhesives 123b, and outgoing radiation of the S polarization component is carried out toward a light guide plate 12. On the other hand, 90-degree rotatory polarization of the P polarization which penetrated the inside of a guide rod 123 from the edge by the side of incidence to the edge of the opposite side is carried out, it is reflected as S polarization by the quarter-wave length plate 125 and reflecting plate 126 which have been arranged at termination, and re-incidence of it is carried out to a guide rod 123 by them. The light by which re-incidence was carried out to the guide rod 123 is penetrated in part in the interface of translucency transparent material 123a and adhesives 123b, it is reflected in part, and after being reflected by the reflecting plate 127, outgoing radiation of the light by which interface reflection was carried out is once carried out toward a light guide plate 12. The light by which incidence was carried out into the light guide plate 12 is in the condition that plane of polarization was maintained, and outgoing radiation is carried out from illumination-light outgoing radiation side 12c.

[0081] Thus, incidence of the illumination light by which will be in the condition almost near the linearly polarized light, and outgoing radiation is carried out from a light guide plate 12 like the gestalt 1 of operation is carried out to the polarizing plate 27 prepared so that the polarization shaft and plane of polarization of the illumination light might be in agreement. Thereby, most light by which outgoing radiation was carried out as illumination light is used in order to check a display image by looking.

[0082] Thus, the guide rod 123 of a front light 120 has the polarization function for acquiring predetermined polarization. Moreover, a guide rod 123 brings close the difference of the refractive index of translucency transparent material 123a of the letter of a block, and the refractive index of adhesives 123b which inclined at 45 degrees to the side face of a transparent material 12 to less than 3%, and makes the brewster's angle about 45 degrees. Moreover, by preparing many interfaces of translucency transparent material 123a, the reflection factor is raised and decline in the reflection factor by approach of the refractive index of translucency transparent material 123a and adhesives 123b is prevented. Furthermore, distribution of outgoing radiation light is also equalized by preparing many interfaces of translucency transparent material 123a.

[0083] In addition, in the gestalt of this operation, the rod object of the pair which joined each inclined planes and constituted the translucency transparent material of the letter of a block which has the inclined plane which inclined at 45 degrees to the side face of a light guide plate 12 like the above-mentioned guide rod 123 as a guide rod, respectively may constitute. In this case, the end faces of each rod object are joined through a quarter-wave length plate and a reflecting plate. Moreover, the inclined plane of each translucency transparent material in each rod object is made into the condition of having inclined in the opposite direction. And LED51 as the point light source is arranged at the end face located in the

outside of each rod object, respectively, and incidence of the light irradiated from each LED51 is carried out to each rod object, respectively.

[0084] (Gestalt 5 of operation) Drawing 14 is a sectional view for explaining the outline configuration of the reflective mold display which are other operation gestalten of this invention. This reflective mold display 140 is replaced with the reflecting plate 26 arranged in the reflective mold display of the gestalt 1 of operation on the outside of the 2nd substrate 22 in the reflective mold display panel 20 shown in drawing 2 , and the hologram reflecting plate 141 is used. Other configurations are the same as that of the reflective mold display of the gestalt 1 of operation shown in drawing 2 . This hologram reflecting plate 141 is produced by irradiating the laser of the 2 flux of light and performing interference exposure to the Du Pont hologram recording film. The light which carried out incidence to this hologram reflecting plate 141 is reflected in the direction [ specular reflection ] shifted. Moreover, the tilt angle in the shape of toothing prepared in the front face of the light guide plate 12 in a front light 10 is controlled, and it is constituted so that about 30 degrees illumination-light 140A by which outgoing radiation is carried out from illumination-light outgoing radiation side 12c may be made to incline from [ of the screen ] a normal. Display light 140B which penetrates the reflective mold display panel 20 and is reflected with the hologram reflecting plate 141 by such configuration is reflected in the direction of a normal of the screen, and optical 140C by which specular reflection is carried out on the front face of the reflective mold display panel 20 is reflected in the direction which inclined about 30 degrees from [ of the screen ] the normal. Consequently, display light 140B and optical 140C unnecessary to a display are not mixed.

[0085] In the reflective mold display 140 of the gestalt 5 of this operation, in case a display image is checked by looking, when outdoor daylight is scarce, a front light 10 is turned on, and light is irradiated by the reflective mold display panel 20. In this case, since display light 140B and optical 140C unnecessary to a display were not mixed, the high display image of contrast was able to be obtained. Moreover, when outdoor daylight fully exists, even if a front light 10 is switched off, the display image which is easy to check by looking brightly can be obtained.

[0086] In addition, with the gestalt 5 of this operation, although the hologram reflecting plate 141 was used as a reflecting plate, if the light or outdoor daylight by which outgoing radiation is carried out from a front light 10 can be reflected in the direction [ specular reflection ] shifted, it is not restricted to this and the reflecting plate which combined the reflector of detailed a large number which inclined to the screen can also be used. Furthermore, although the reflecting plate was installed in the rear face of the reflective mold display panel 20 with the gestalt 5 of this operation, it is good also as a configuration which installs a reflecting plate in the interior of the reflective mold display panel 20.

[0087]

[Effect of the Invention] As explained in full detail above, when outdoor daylight is scarce, according to the reflective mold display of this invention, the use effectiveness of light source light can be raised by making the front light of this invention which makes predetermined polarization the illumination light and carries out outgoing radiation turn on. Therefore, the display brightness of a reflective mold display can be raised. Moreover, low-power-ization can be attained if it is the reflective mold display of the same display brightness. Furthermore, since leakage light by the side of the screen can be lessened, the display with high contrast can be obtained. Furthermore, an unnecessary leakage light by the side of the screen can be further decreased by making in agreement the plane of polarization of the polarization shaft of the predetermined linearly polarized light, and a polarizing plate by which outgoing radiation is carried out through a light guide plate from the light source. According to this configuration, the display which reversed the negative positive can be performed by the case where it displays using the illumination light, and the case where it displays using outdoor daylight. Furthermore, rebound ace court processing of the screen used from the former, nonreflective coat processing, a touch panel technique, etc. can also be used by arranging a polarizing plate to the screen side of a reflective mold display panel.



Furthermore, by combining the reflective mold display panel which displays from a front light by reflecting the light or outdoor daylight by which outgoing radiation was carried out in the direction [ specular reflection ] shifted, and the front light of this invention, not only when a front light is turned on, but when a front light is switched off, the bright high display of contrast can be obtained.

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] It is a perspective view for explaining the outline configuration of the front light concerning the gestalt 1 of operation.

[Drawing 2] It is a sectional view for explaining the detailed configuration of the front light concerning the gestalt 1 of operation.

[Drawing 3] It is a sectional view for explaining the detailed configuration of the light guide plate in the front light concerning the gestalt 1 of operation.

[Drawing 4] It is a fragmentary sectional view for explaining the outline configuration of the reflective mold display concerning the gestalt 1 of operation.

[Drawing 5] It is a perspective view for explaining the outline configuration of the front light using LED concerning the gestalt 1 of operation.

[Drawing 6] It is a perspective view for explaining the outline configuration of the front light concerning the gestalt 2 of operation.

[Drawing 7] It is a plan for explaining the detailed configuration of the front light concerning the gestalt 2 of operation.

[Drawing 8] It is a partial plan for explaining other examples of a configuration of the front light concerning the gestalt 2 of operation.

[Drawing 9] It is a plan for explaining the outline configuration of the front light concerning the gestalt 3 of operation.

[Drawing 10] It is a plan for explaining the detailed configuration of the front light concerning the gestalt 3 of operation.

[Drawing 11] It is a fragmentary sectional view for explaining other examples of a configuration of the reflective mold display concerning the gestalt 3 of operation.

[Drawing 12] It is a plan for explaining the outline configuration of the front light concerning the gestalt 4 of operation.

[Drawing 13] It is a partial plan for explaining the detailed configuration of the guide rod which has a polarization function in the front light concerning the gestalt 4 of operation.

[Drawing 14] It is a fragmentary sectional view for explaining the outline configuration of the reflective mold display concerning the gestalt 5 of operation.

### [Description of Notations]

10 Front Light

11 Linear Light Source

12 Light Guide Plate

12a The gentle slope section of a light guide plate

12b The steep incline section of a light guide plate

12c The illumination-light outgoing radiation side of a light guide plate

13 Prism Sheet

14 Reflective Polarization Film

15 Dispersion Reflecting Plate  
 16 Reflecting Plate  
 20 Reflective Mold Display Panel  
 21 1st Substrate  
 22 2nd Substrate  
 23 Electrooptic Material  
 24 25 Translucency electrode  
 26 Reflecting Plate  
 27 Polarizing Plate  
 28 Quarter-wave Length Plate  
 29 Polarizing Plate  
 31 Light Source Light  
 32 P Polarization Component  
 33 S Polarization Component  
 34 Re-Incident Light  
 35 P Polarization Component  
 51 LED  
 52 Quarter-wave Length Plate  
 53 Reflecting Plate  
 60 Front Light  
 62 Guide Rod  
 62a V groove  
 62b Dispersion transparency section  
 62c Scatter reflection section  
 66 Dispersion Reflecting Plate  
 84 Cholesteric-Liquid-Crystal Film  
 85 Quarter-wave Length Plate  
 86 Polarizing Plate  
 90 Front Light  
 92 Prism Sheet  
 93 Polarization Beam Splitter  
 94 Reflecting Plate  
 95  $\frac{1}{2}$  Wavelength Plate  
 96 Wedge-Action-Die Transparent Material  
 96a The flat-surface section of a wedge-action-die transparent material  
 96b The slant surface part of a wedge-action-die transparent material  
 120 Front Light  
 122 Prism Sheet  
 123 Guide Rod  
 123a The small block transparent material which constitutes a guide rod  
 123b Adhesives which constitute a guide rod

125 Quarter-wave Length Plate  
126 Reflecting Plate  
127 Reflecting Plate  
140 Reflective Mold Display  
140A Illumination light  
140B Display light  
140C Specular reflection light  
141 Hologram Reflecting Plate